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AGRICULTURAL JOURNAL

ISSUED BY THE

DEPARTMENT OF AGRICULTURE, FIJI.

VOL. 12.] DECEMBER, 1941. [No. 4.

EDITORIAL.

THIS number of the *Journal* marks the end of the second full year of war conditions and economy is indicated in the curtailed annual report of the Department for the year 1940 which is included. The report should prove interesting reading, however, as affording an outline of the general work of the Department in its different aspects and as a record of progress despite adverse circumstances. The general trend towards increased local food production is indicated and the experimental, developmental and instructional aspects of the Departmental activities are briefly portrayed. The organization of internal marketing of local produce has been given close attention and since the report was written the small market at Nausori now handles more than £600 worth of Fijian produce monthly and hence is performing a most necessary function. The excellent work accomplished in maintaining our dairy herds practically free of tuberculosis is noteworthy.

Attention is directed to the possibility of tanning our own leather in an interesting note on this subject by the Senior Veterinary Officer. This note indicates that there should be no insuperable difficulties in establishing tanneries capable of processing all our local hides with a reasonable expenditure in tanks and other equipment and it is hoped that local enterprise will rise to the occasion and make a start at an early date.

The nutrition of the people is a subject which has received much attention recently through the activities of the Fiji Nutrition Committee, which was formed at the instance of the Secretary of State for the Colonies. The Committee is at present conducting a series of broadcast talks and press publications in an effort to stimulate action, especially amongst native and Indian races. The close relationship between nutrition and agriculture is outlined in an article in this issue, which indicates that there can be little doubt that the development of a balanced agriculture is the surest way of ultimately achieving a sound and balanced nutrition for the people at least cost to themselves and to the Government. This should prove interesting reading, especially as it shows the wide scope of the subject and touches on Departmental activities designed to anchor small holders to the land with a view to improvement of their general standards of living.

Under agricultural notes, several items of immediate practical interest are mentioned including a precis of a padi planting survey in Suva area, copra grading report, recent plant and seed introductions and marketing notes. These will be read with interest.

With increasing aerial transport facilities, attention is directed by the Botanist to the need for soil sterilization and seed disinfection and methods of achieving these objects are succinctly outlined in a note on plant protection. Similarly the Entomologist portrays the wisdom of exercising due precautions to prevent the introduction of undesirable insect pests and points out the good example set by Pan-American Airways in dealing with plant tissues and any insects that may be carried in transit around the Pacific.

The position of the small coconut weevil " Diocalandra " in Oceania is reviewed in a useful note and it is pleasing to note that this pest is of minor importance in Fiji.

In a note on the recent agricultural show, the great improvement in the quality of vegetable produce is stressed and is attributed largely to the stimulation of vegetable growing provided by the material expansion of the local market.

DEPARTMENT OF AGRICULTURE.

(Annual Report for the Year 1940.)

By
H. W. JACK, O.B.E., B.A., D.Sc., M.L.C.,
Director of Agriculture.

SECTION I.

GENERAL AGRICULTURAL CONDITIONS.

1. The year under review was an unusually difficult one, owing to war conditions, and in some directions work had to be curtailed, while additional work arose from the incidence of war, especially in the matter of increasing local food supplies, to which much attention was directed.

2. In the dry zones, drought conditions prevailed, except for the very wet month of May, and rice was greatly retarded accordingly, the yields being, in many places only half a normal crop, although an increased area was planted. Similarly, much of the planted tobacco and cotton failed, pineapples were slow in maturing and sugar crops were below average, although the returns showed a high sugar content per ton of cane crushed. The dry weather enabled maize of unusually good quality to be produced, and a small export to New Zealand was possible. Potatoes yielded fair crops of good average quality which were readily saleable.

3. In the wet zones the prolonged drought seriously interfered with rice planting, so that crops were low in most areas. For other crops, the weather conditions were good, especially for vegetables, which were available in abundance up to the end of the year.

4. There was a general trend towards an increase of areas under food crops, the Fijians, in particular, responding well to His Excellency the Governor's appeal for more local food production. Dalo and kumalas were in excess of demand for some months. The ability of peasant farmers exempted from communal duties to produce surplus food crops was marked by the outstanding success of their market at Nausori, which proved a great boon in supplying the increased demands in Suva for vegetables and fruit in particular.

5. The Indians also have become more foodcrop conscious throughout the Colony, and there are indications that the present season's rice crop will show a substantial increase over the past few years. This is due, in some measure, to the increased costs of imported foods, especially rice and sharps. The Colonial Sugar Refining Company also assisted by encouraging the cultivation of quick growing foodcrops on fallowed sugar lands.

6. Rice imports amounted to 2,001 tons valued at £30,115, and local prices for padi in some areas reached £12 per ton. In general, however, the prices of agricultural produce remained steady, while the increase in the costs of living since the beginning of the war was estimated at 21 per cent for Europeans and 18 per cent for Indians.

Copra.

7. The copra depression greatly curtailed the spending power of a substantial section of the people, and a Conference in Sydney, at which representatives of all Pacific territories were present, was arranged with a view to finding some solution to the problem of marketing copra. Certain additional concessions were made to copra producers as a measure of relief to the industry. These include remission of various minor taxes and fees.

8. Substantial quantities of copra were, however, marketed, mostly on the basis of exchange of goods by the merchants at a nominal price around £3 10s. 0d. per ton, and exports amounted to 20,379 tons valued at £125,063. A marked improvement in the grade of copra produced by natives was shown at Levuka where, during the last two months, approximately half the copra was graded as first quality. A number of planters are giving attention to pig and poultry breeding as a means of supplementing or replacing copra sales.

Bananas.

9. The banana industry experienced a good year in comparison with 1939 though the falling volume of exports is a cause of much concern. The exports amounted to 90,290 cases valued at £41,747 and the native growers gained approximately 3s. 10d. per case for the fruit. Owing to shipping difficulties, it was not possible to reorganise shipments to Canada or Australia. The willing co-operation of the shippers and of the Union Steamship Company is gratefully acknowledged.

Dairying.

10. The Dairying industry experienced an excellent year, 580,985 lb of butter fat being purchased by the two main factories to make 541,817 lb of butter and 146,995 lb of ghee. Indian owned dairies have shown much improvement during the past few years, due to the combined activities of the Sanitary Inspectors and the Veterinary Officers of the Department. Interest in poultry has steadily increased and many pure bred cocks have been distributed to grade up local hens. The marketing of locally produced meat, vegetables and fruit has been greatly stimulated in the last few months by the increased demand, mainly in Suva, and also at the Gold Mines, and prices have been maintained at reasonable levels. The Field Staff greatly assisted in organising the collection and transport of vegetables and fruit.

General.

11. Considerable attention was devoted to means of improving native food crops and rice by a study of varieties, with a view to the selection of the best and this work should bear fruit in due course. The New Zealand Centennial Exhibition, at which the Colony was well represented, closed at the end of May. The Fiji Section gained favourable comment, and reflected credit on the work of the officer-in-charge (Mr. D. A. Donald). Price control activities and, during December, petrol control, were added to the duties performed by the Department and in these activities the helpful co-operation of the merchants, District Commissioners and officers of other Departments was much appreciated.

SECTION II.

WORK OF THE DEPARTMENT.

The General Experiment Station.

12. At the General Experimental Station, Sigatoka, considerable development took place, this being the first full working year since its reorganisation as the principal experimental and training centre. A second dormitory, a mess-room, pig styes, cow bails and poultry yards were built and some fencing undertaken. The total area under cultivation is now approximately 60 acres. Pigs, poultry, a Suffolk Punch Stallion, and the nucleus of a dairy herd were established, and permanent plantings of citrus, avocadoes, cashew nuts, dwarf coconuts and tung oil trees were maintained. Experimentation

was concerned mainly with selections of Sea Island cotton and Sea Island x Kidney Cotton crosses; variety trials of Upland cotton; sugar cane rotations and general rotations; tobacco, chillie, dhall and sweet potato variety trials; fertility exhaustion experiments. Observations were also conducted on a number of minor crops of possible potential importance including "derris" root, soya bean, numerous vegetables, flax, potatoes, maize, millet, onions, ginger, etc. Thirty students were in residence throughout the year and improved greatly in physique and appearance under the routine work and regular feeding conditions, the average increase in weight of all the students being 11 lb. They were given a good general training in all normal farm operations and gained building experience in the erection of all farm buildings to house live stock. The rainfall was unusually low, 55·02 inches only being recorded.

Nasinu Agricultural Station.

13. At Nasinu Station, where the rainfall was 122·74 inches, poultry breeding facilities were further extended to meet the demands from the public, and during the year over 800 birds and over 500 setting eggs were sold, while 102 birds were distributed free to various institutions for breeding purposes. Distributions included Australorps and Rhode Island Reds, the latter recently gaining in popularity. Muscovy and Khaki Campbell ducks were added to the poultry during the year. The nucleus of a small Red Poll herd was established and the small pig section prospered well, 27 young pigs being sold or transferred to various approved institutions for breeding purposes.

14. The ornamental and economic nurseries were maintained, and some 8,000 parcels of planting materials were distributed. The demand for budded citrus planting material far exceeded supply, and this section is being extended. A critical examination of all imported and local citrus varieties represented on the Station was made and proved valuable in guiding future work. The arboretum was maintained. Ten students were in residence during the year and gained useful experience in all branches of stock maintenance, in citrus culture, in contouring and compost making and in general nursery work. The revenue collected amounted to £184 and material to the value of £214 was distributed free to schools and other institutions.

Central Agricultural Station.

15. At this station, with a rainfall of 128·17 inches for the year, botanical work included the maintenance of the Herbarium, to which some 1,200 specimens were added; identification of some 250 species, also varietal studies of dalo, kumala, bananas, rice, citrus, tapioca, coconuts, Manilla Hemp, ramie, soya, maize and various vegetables. Mycological duties included routine spraying of experimental crops, rotational experiments for the control of general banana diseases, selection for control of Bunchy top virus, spraying experiments for the control of leaf spot of bananas, etc.

16. In all, 24 acres were maintained in the cultivations and experiments indicated above, in addition to grazing paddocks and three acres planted with 23 different tree species. In addition, the model farm was maintained, containing rice, derris, citrus, cacao, tea, ginger, maize, dalo, kumalas, tapioca, etc., and pigs and poultry were housed and native quarters built for the caretaker. Also, the farm was contoured and terraces are gradually being formed economically. There were 14 student workers on the Station, which was inspected by 863 visitors during the year, of which 657 were Fijians and 148 were Indians. The revenue collected amounted to £57, while planting material to the value of £101 was distributed free.

Agricultural Development.

17. Six sub-stations were maintained for the demonstration of practices within the scope of peasant farmers, such as the use of working stock and draught implements, diversification and rotation of crops, anti-erosion methods, manufacture of compost and pen manure, pasture improvement, planting of timber trees, fruit trees and other economic permanent crops. Some of the sub-stations have developed very usefully, and are coming to be regarded as centres of farming effort amongst Fijians in the districts in which they are situated. The four Fijian settlement schemes supervised by the Department show sound progress, most ot the settlers are now well established, as indicated by abundance of food, plantings of fruit and permanent crops, the purchase of working stock and implements and improved housing. The majority have paid their rents regularly and many have Savings Bank accounts. Two of these settlements depend upon bananas as the main cash crop, one on mixed crops and one on rice. The latter (at Rewa) after two years slow progress has recently experienced a large influx of settlers, possibly due to the prevailing high prices for padi, but it is as yet early to say how Fijians will settle down to intensive rice cultivation.

18. A large area of generally flat land lying between the King's Road and the Rewa River at Toga was taken over by the Department for development as a rice settlement for Indians and Fijians. The scheme envisages some 2,000 acres available for rice, subject to drainage possibilities, but surveys of drainage requirements were not possible during the brief period available before the end of the year. Some 300 acres of the more easily accessible land were demarcated in small blocks for immediate clearing and planting by Indians already resident in the locality.

Agricultural Instruction.

19. The training of Fijians in improved agricultural practices of a fundamental character was continued. Basically, the training consists of practical work with working stock (horses and bullocks) and implements, the planting and care of a wide range of crops for consumption and sale, soil conservation practices, including contour farming and the manufacture of pen manure and compost, the care of poultry, pigs and dairy stock. Residential pupils numbered 57, engaged in two or three year courses of training, and the course has now been reorganised so as to allow of two years basic training at Sigatoka, followed by a year at either Nasinu or Navuso, where more specialised experience in poultry, citrus, nursery work, bananas, and wet zone crops generally is gained. Nine leaflets were printed for distribution to small farmers, the subjects being Cotton, Tobacco, Dhall, Spices, Production of Indian Foods, Production of Fijian Foods, Soil Erosion, Rotation of Crops, Feeding and Care of Calves. Those of Fijian interest were published in *Na Mata*.

20. Five provinces also maintain training farms under the management of local committees, in the management of which Agricultural Officers were closely concerned. On these farms some 70 pupils were resident, and these youths were able to supplement their knowledge of food crop or subsistence farming as practiced in their own homes with experience of crop raising on a wider basis; the training is in general similar to that given on Departmental stations, but the same close supervision of work is not possible. Selected trainees from the provincial farms are given opportunities of completing their training on Departmental stations. One province also subsidised pupils for training on one of the latter stations. The province of Lomaiviti decided to close their farm at the end of the year, owing to lack of interest

by the people in this scattered island community. The influence of the Kadavu training farm is shown in greatly increased shipments of fresh vegetables from Kadavu to Suva. The Colonial Sugar Refining Company's Fijian Training Farm also reports a very good year.

21. Much attention has been given to farming activities at Provincial and Districts schools, as these institutions provide opportunities of interesting and of influencing future farmers at an early age. Advice has related to crop rotations, contour farming and the improvement of livestock. Many of the smaller Indian and Fijian schools have also been provided with planting material of ornamental and economic trees, etc., to enlist the interest of teachers and pupils.

22. The field staff, European, Fijian and Indian, were constantly on tours of inspection and advice, amongst peasant farmers particularly. Amongst Fijians, advice and instruction concerned the maintenance of an abundance of food crops, the cultivation of fresh vegetables and fruits, the planting and care of bananas, maize, rice, potatoes, pineapples, coffee, tea, and kapok, the care of poultry and advances for the purchase of livestock and implements. Indian farmers are more self-reliant and less accustomed to ask for assistance. Advice to them was chiefly in connection with the growing or marketing of rice, tobacco and cotton. Propaganda was conducted for the wider adoption of native root vegetables to reduce the Indian's dependence on rice. The investigation of trespass complaints, usually between Fijians and Indians, also occupied much time in the more closely settled districts. Seed of improved varieties of padi, European vegetables and groundnuts were distributed for planting and more mixed farming was advocated for agricultural and nutritional reasons.

Produce Inspection and Marketing.

23. All fresh produce entering the Colony for consumption and all seeds and planting materials were subjected to the usual inspection for freedom from pests and disease. Assistance to growers to find markets, external and internal, for their produce is an increasingly important function of the Department. This assistance is limited wherever possible to the inspection and grading of produce for quality, where quality is a determining factor in demand, and to bringing grower and buyer into contact by the encouragement and organisation of markets and transport facilities. Direct responsibility for handling and sale is accepted only as a temporary expedient where existing facilities for the disposal of produce are inadequate.

24. All bananas for the New Zealand market were graded before shipment, 82 per cent of the total export of 90,000 cases being graded as first quality. Packing stations were attended as frequently as possible for the general supervision of buying and packing arrangements. Over 8,000 cases of citrus (two-thirds of which were mandarins) were received into the inspection sheds at Suva for grading, packing and shipment to New Zealand.

25. Towards the end of the year a small export trade in maize for the New Zealand market was being worked up. Special attention was paid to dryness and soundness, though facilities for drying and storage are quite inadequate for the handling of large consignments.

The manufacture of twist or stick tobacco from leaf purchased from peasant farmers was continued, and this found a fairly ready sale at the gold mines and in small lots to other Pacific Islands. The latter trade has not developed, largely due to the reduced purchasing power of native copra producers.

Two cotton ginneries were operated, one at Sigatoka and one at Labasa, and 45 bales, of 300 lb lint, were purchased and ginned for sale overseas, while 20 tons of cotton seed were locally sold for use as cattle feed.

26. The contraction of demand for copra and the consequent depression of the local industry has directed attention for some time past to a search for possible subsidiary export crops. The climate and soils of Fiji are favourable to the production of most tropical and subtropical crops, which narrows down the search to products for which a near market can be found and which can be produced at competitive prices. The latter condition is the chief obstacle, as production costs are high, due to internal transport costs, comparatively high wage rates, influenced directly or indirectly by the prosperous sugar and gold industries, and to the ease of subsistence farming for the native populations. Inquiries have been directed to the possible expansion of export markets for the banana and cotton industries, the wider local use of copra as stock feed or in the form of soap and edible oil, and to the possible encouragement of export industries in maize, soya bean, ginger, chillies, tobacco, paper mulberry, candlenuts, tapioca starch, castor seed and grapefruit.

27. The organisation of internal marketing of produce for local consumption has recently demanded close attention. The Nausori Fijian Co-operative market established early in the year by the peasant farmers of the surrounding districts experienced a highly successful season, largely due to the greatly increased demand for fresh vegetables and fruit in the Suva area. Over 50,000 lb of fresh produce, valued at £250, is being handled by the market every month, the area served embracing the greater part of the Rewa, Tailevu and Naitasiri Provinces. During the early months of its existence, the market required much assistance by the Department in organising deliveries and sales and keeping records, but it is now to a large extent, managed by the Fijians themselves. Other organisations have been similarly assisted to dispose of their produce. At Lawaqa, a regular township market has been established; the organisation of markets at other centres and the provision of shelter and other facilities is highly desirable in the interests of greater consumption of locally grown produce. An effort was made to interest one firm in local tea production with some success, and small quantities of rubber were exported. Departmental exhibits on a restricted scale were prepared for the annual Suva Show, and the Produce Inspection Division gave the usual assistance in the organisation of the competitive agricultural sections.

Chemical Activities.

28. The Chemical Division received 993 samples for analysis and performed over 2,500 separate determinations. The samples were received from Government Departments, private individuals and firms and the number of analyses constitutes a record in the history of the laboratory, despite absence of staff on war work. The samples included minerals, ores, milks, liquors, foodstuffs, drugs, fertilizers, soils, waters, pastures, oils and general forensic materials. Useful research was conducted in connection with mustard oil, and the comparison of various types of citrus. Lectures in Chemistry and Physics were given to medical students at the hospital; much advice was tendered to the military on a variety of subjects and expert evidence rendered in the courts.

Entomology.

29. Entomological work was mainly focused on the green vegetable bug (*Nezara viridula*) the distribution of beneficial parasites in the Colony, as

well as to other countries, investigation of newly reported pests and other miscellaneous insects.

General advisory matters included scales, mealy bugs, aphids, cockroaches, fruit flies, mites, slugs, earth worms, crabs, plague fleas, etc. The useful giant toad was sent to the Solomon Islands; the Plæsius beetle predaceous on the banana borer was sent to Rarotonga; over 34,000 fruit fly parasites were liberated in various localities; the lantana bug was sent to Western Samoa; the dung beetle was multiplied for distribution in pastoral areas and records of numerous injurious insects were maintained. Lectures were delivered on Zoology to medical students at the hospital.

PUBLICATIONS.

30. The Entomologist also functioned as Librarian and Editor of the *Fiji Agricultural Journal*, issues of which were maintained quarterly, and appear to serve a useful purpose and to be of much interest to local and overseas readers.

VETERINARY DIVISION.

31. This Division continued to carry out the provisions of the Stock Improvement Ordinance, the number of animals dealt with being as follows:—

	Licenced.	Castration ordered.	Castrated by staff.
Bulls	140	201	35
Stallions	4	24	19

At Suva 656 animals received attention while 156 were admitted to hospital; at Nadi 105 animals were treated.

32. All animals arriving in the Colony were subjected to the provisions of the Animals Importation Ordinance. One shipment of poultry was subsequently discovered to be affected with Bacillary White Diarrhœa and the fowls were kept under observation and control. This is the first record of this disease in the Colony. Much attention was given to the encouragement of dairying and to increase in pig and poultry production by demonstration, advice and provision of stock.

33. Under the Animals (Contagious Diseases) Ordinance, 1918 cows were tested for tuberculosis, 130 (or 6·77 per cent) proving positive reactors. In registered dairies in Suva, of 837 cows tested only 9 or 1·05 per cent gave positive reactions. Contagious abortion has been brought well under control by a combined system of testing and destruction in some cases. The Agglutination test was applied in 482 cases, 73 (or 15·1 per cent) proving positive. Other diseases encountered included one case of malignant eodema in a horse, distemper of dogs, filariasis in dogs, mastitis in cows, infectious keratitis in cattle, horses and sheep, rheumatism in pigs, fowl pox and infectious coryza and various parasites in poultry. In the clinical laboratory 376 specimens were examined, in addition to 482 aggulination specimens.

34. The animal population is now estimated to be 14,000 horses, 75,000 cattle, 480 sheep, 26,000 goats and 45,000 pigs. Compulsory branding of animals coming into force in 1941 led to a great increase in the number of brands registered (247 by 31st December, 1940.) Considerable attention was given to pasture improvement, top dressing trials being continued. Local food required the slaughter of 6,500 cattle, 2,000 pigs, 400 sheep and 4,000 goats, while, 6,289 hides valued at £3,351 were exported. Experiments in tanning hides locally indicated distinct possibilities in this direction.

Animal importations included 3 cattle, 139 sheep, 3 goats, 9 pigs, 19 domestic pets, 195 poultry and 15 birds.

35. I would place on record my appreciation of the loyal, interested and painstaking service and the ready co-operation of all my staff.

THE AGRICULTURAL SHOW, 1941.

As judged by the quality of exhibits the agricultural and vegetable sections of the Agricultural Show manifest continued inprovement, the vegetable section particularly shows the influence of the great stimulus to vegetable production provided by the expansion of the local market. As His Excellency remarked in his speech on the occasion of the opening of the Show, the quality of many of the vegetable exhibits could not be bettered in any temperate climate. The improvement in quality of cabbages, tomatoes, carrots and celery is especially noticeable, while some quite fair cauliflowers were on show. These latter do not yet approach the quality of cauliflowers from overseas, but it is only recently that their local cultivation has become at all popular. The toll of caterpillars and slugs taken by the giant toad is another reason for the heavy yield of vegetables.

The small number of entries for many of the agricultural classes is disappointing, for too many classes only one or two entries were received and for some classes none at all. Most of the competitive agricultural classes are designed to appeal largely to Indian and Fijian farmers and lack of support indicates the need for greater effort at publicity amongst this type of farmer and also for improvement in transport facilities for the Show.

No entries were received for the copra classes though it had been expected that the new class instituted this year for samples taken at random from nominated commercial consignments would attract entries, especially in view of the evident—and in the majority of cases, successful—efforts by planters to improve the quality of their copra since purchase at differential prices was introduced. The banana classes also were poorly supported, but this reflects the late recovery of the industry from the effects of the severe February hurricane. The rice and maize classes were fairly good, especially the former, and also those for vegetables and fruits for export: tomatoes, egg plant and grenadillas. Unfortunately the time of year does not coincide with the season for many of the local fruits: orange, mandarin, mango, avocado, and is too early for pineapples also.

The two district exhibits from Kadavu Province and from the Southern Agricultural Division (comprising the Provinces of Tailevu, Rewa, Naitasiri and Namosi) were especially fine. The Kadavu exhibit was awarded the Sir Maynard Hedstrom cup and the people of Kadavu and especially the Native Field Assistant in charge, Emosi, are to be congratulated on their fine display and meritorious win. These were made up entirely of Fijian-grown produce and were staged by Fijians. Both exhibits included a great variety of fresh produce (vegetables and fruits) in addition to grains, spices, tobacco and some handicrafts. To many Show visitors it must be tantalising to see so much produce that finds its way to Suva so seldom, or in insufficient quantity. This problem will not be satisfactorily solved until adequate market facilities for fresh produce can be provided in Suva.

The Departmental exhibit featured a display of some twenty of the many wild species of plant in common use by Fijians and Indians as spinach, including many weeds of cultivated land, also ferns, and the leaves of crops grown primarily for other parts of the plant such as dalo, tapioca, kumalas and chillies. Many of these are palatable and are worth a trial by Europeans themselves in parts of the Colony where other green vegetables may be difficult to obtain regularly, and by institutions such as schools. The stand also included a variety of introduced beans: soya, lima beans, pigeon peas, etc., which are under trial; leaf tabacco of many varieties, locally manufactured cigars and cheroots (which have an increasing local sale)

and trade "stick" tobacco. Varieties of padi selected for heavy yielding ability and hulled rice were on show and attracted much attention from Indian visitors particularly. Samples of locally made leather attracted attention as a potential new industry in Fiji.

The Division of Entomology exhibited specimens of the harmful green vegetable bug *Nezara* with the Egyptian egg parasite *Microphanurus* introduced from Australia. This was accompanied by a map showing the distribution of the bug from Malaya to Tonga and its recent spread throughout Fiji. A second exhibit displayed the beneficial insects controlling pests and noxious weeds which have been sent to various islands in the Pacific. This particular exhibit was shown at the Royal Agricultural Show, Sydney, during Easter.

The attendance at the Show was better than in 1940 and it was gratifying to find a definite improvement in the quality of most of the Agricultural produce displayed. —C.H.

HORSE BREEDING.

The attention of agriculturalists is drawn to the possibility of a shortage of bullocks, suitable for ploughing, within the next few years. Owing to the increased demand for beef now existing in the Colony, greater numbers of these animals are being slaughtered. Agriculturalists therefore, having this in mind, should consider early the advisibility of the gradual introduction of additional horses for traction in agriculture.

The horse population of the Colony is at present considerably in excess of the numbers actually being used and it should be possible to increase the number of horses used in farm work. Some training, however, will be necessary as well as the provision of satisfactory harness.

Horse breeders should bear in mind also the need for more attention to breeding the type of horse suitable for use with ploughs and harrows.

The most suitable type of horse as a stallion is a stout-bodied, strong limbed horse, with as little hair as possible on the legs. The horse should have good weight and size. Amongst the pure-breds the Suffolk or the Percheron embody the most desirable features for the requirements of horse-breeders in Fiji. The number of pure-bred animals, however, is limited and should it be necessary to breed from cross-bred stallions, the above features should be borne in mind. Except in the special requirements for the breeding of race horses, horse breeding from animals of thoroughbred type should cease, since such animals are of little use in agricultural operations and it is in the latter sphere that the demand for horses is almost certain to increase in the near future. —C.R.T.

PLANT PROTECTION.

(Notes from Plant Pathological Laboratory—II).

By

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In subsequent notes on plant protection, reference will of necessity be made to soil sterilization and seed disinfection.

It is therefore appropriate to describe these methods more fully in advance.

1. SOIL STERILIZATION.

Inasmuch as many plant pathogens inhabit the soil and are carried over therein from one crop to the next, soil sterilization has been recommended as an effective means of control. This method is usually confined to small areas and is particularly useful in the case of glass-house crops, such as tomatoes, in which the cost of treatment is many times covered by the increase in yield due to the absence of pests and diseases.

Steam.—Sterilization of the soil by means of super-heated steam has proved the most effective method but is not available, at least locally, to the small holder and gardener.

Fire.—Where wood is abundant, sterilization of the soil by fire is a cheap and efficient method and one normally used by Chinese market gardeners. Simmonds (1) states that " the amount of wood required can be reckoned as the equivalent of a solid layer of about three inches thick " and advises that " the soil should be moist and neither dry nor excessively wet when firing takes place."

A local example of soil sterilization by fire may be seen in many native villages where the site of houses which have been burned down are invariably used as tobacco beds.

Chemicals.—Chemical methods of soil sterilization have proved useful locally but are limited in application to small and suitably placed areas. Formalin, Bluestone and Cheshunt compound are three substances which have been used for seed-bed sterilization with good results.

(1) *Formalin.*—Commercial formalin or formaldehyde is a liquid containing approximately 40 per cent formalin. This is broken down with water to make the soil sterilizing solution as follows:—

For dry soil, dilute one gallon commercial formalin in 100 gallons water and apply at the rate of 10 gallons to the square yard of surface. Immediately after treatment, the beds must be covered with sacks or layers of dead grass to keep in the fumes.

Following treatment, the soil must be aired for not less than a fortnight to free it from the formalin before seeds are sown or plants put in.

Formalin solution is a useful disinfectant for garden tools, sheds and other zones of infection.

It is emphasized that care must be taken to avoid reinfection of treated beds either by wash from untreated soil or by soil brought in on boots, tools, etc.

(2) *Bluestone.*—A solution of Bluestone, made by dissolving one pound in seven gallons of water, may be used in a similar way to formalin and has proved effective in Queensland in eradicating from garden beds, the soil fungus—*Sclerotium rolfsii*, which is a common pathogen in Fiji of *Caladium*, soya bean, cowpea, peanuts and many garden plants.

The solution is watered on at the rate of two gallons per square yard or until the soil is wet to a depth of six inches (1).

As with formalin, the beds treated with Bluestone cannot be used until a few weeks have elapsed and this solution cannot be used on ground in which plants are growing.

(3) *Cheshunt Compound.*—This solution is a useful soil-disinfectant, it may be used without injury on soil in which plants are growing and it also has a slight fertilizer action on young plants.

It has proved valuable for treating seed beds and boxes and for controlling damping off of seedlings, and root and crown diseases in the garden.

The stock mixture is prepared by grinding separately two ounces of copper sulphate (bluestone) and eleven ounces ammonium carbonate (rock ammonia). These are then thoroughly mixed together and stored in a tightly stoppered jar for at least 24 hours before using.

To make the solution, dissolve the mixture in water at the rate of one ounce to two gallons, or preferably, dissolve the mixture first in a little hot water and then make up to the required strength with cold water.

It should be noted that solutions containing copper sulphate will corrode metals so that all containers, watering cans, etc., should be washed well with fresh water after use. Preferably such solutions should be made in glass, earthenware or wooden vessels.

2. SEED DISINFECTION.

Many plant diseases are seed borne and it is likely that many of the diseases now common in the gardens of Fiji have been introduced with the seed. Tubers, bulbs, cuttings and suckers of plants are equally, if not more, liable to infection; and therefore the spread of disease may be prevented by careful selection of seeds and planting material as well as by using some effective means of treating such material.

The most commonly used seed disinfectants are corrosive sublimate, formalin, hot water, copper carbonate, copper sulphate and many proprietary compounds, these latter usually containing mercury.

Specific treatments have been worked out for individual types of seed.

REFERENCE.

(1) Simmonds, J. H.—1938. "Plant Diseases and their Control."—Brisbane.

REVIEW.

"VEGETABLE GARDENING IN MALAYA" MILSUM AND GRIST.

This very useful book has just come to hand. It is very well written and is a mine of information to gardeners and others who are anxious to extend their gardening knowledge as well as "dig for Victory." Information covers all essential features such as climatic conditions, selection of a garden site, general layout, terracing, compost making, watering, together with a very useful list of vegetables, many of them well known in Fiji, and their food values. Chapter XIV contains hints on school gardens and land settlement, both of which have been attempted on comparative lines in Fiji.

The chapters on pests and diseases are very clear and exceedingly useful to the lay person and should prove an important aid to identification and control of the sundry pests which afflict all gardens.

The authors are to be congratulated on the preparation and publication of such an excellent and useful book. —H.R.S

NUTRITION IN RELATION TO AGRICULTURE.

By
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Director of Agriculture.

THE formation of a local Nutrition Committee at the instance of the Secretary of State for the Colonies to investigate all matters appertaining to nutrition problems in Fiji amply indicates their importance.

The Committee has already published several articles bearing on various aspects of the local nutrition problems and in this article interest is directed to the general relationship of nutrition to agriculture.

The vital importance of this relationship is well recognized since the primary aim of agricultural development is the establishment of a permanent balanced agriculture which, in turn, provides the producer with an adequate and balanced nutrition.

In a circular letter in 1939, the Secretary of State for the Colonies stated that, in formulating any scheme of agricultural development, " importance should be attached to the adequate provision of locally produced food supplies in such variety as the requirements of a balanced and improved nutrition demand."

The present war conditions emphasize the urgent need of paying more attention to the improvement of local food supplies and the establishment of sound and balanced systems of crop and animal husbandry.

These matters have already been engaging the attention of the Department of Agriculture and during the last few years investigations aiming at the general improvement of the standard of living of the Fijians in particular and also of the Indians have been progressing slowly but steadily.

Amongst such investigations mention may be made of the collection, study and trial of local and introduced varieties of rice; the study of available and introduced pulse crops suitable for inclusion in peasant farming systems; the collection and study of local and introduced varieties of " dalo," tapioca, yams, sweet potatoes, bananas and breadfruit. Studies also embrace crop rotations with a view to crop diversification, the maintenance and improvement of soil fertility; the conservation of soil against erosion and finally mixed farming methods applicable to Fijian and other small holders.

Such studies are necessary, not only because it is desirable to select those strains of crop plants which will give the heaviest crops but also because the composition of plants varies in organic and inorganic components according to climatic, soil and manurial conditions and such variations may play an important part in the nutritive value of crops.

Many of these investigations are still in their initial stages for they cannot be unduly expedited. It may be stated, however, that material variations in yielding ability, in palatability and other economic characteristics have already been found, indicating the wide scope for improvement that may be effected by selection methods which, in increasing yields from existing crops, offer far the most potent means of increasing foodstuffs for the people.

It is recognized that the requirements of human nutrition and of improved agriculture go hand in hand and, hence, attention to agriculture is ultimately bound to affect nutrition beneficially.

This axiom has been the basis of schemes of settlement for Fijian farmers whose interest in their land tends to stimulate a sense of self-reliance and responsibility which in turn creates the desire for diversification of production and hence of better living standards.

The increasing number of individual Fijian farmers bears testimony to their desires for self-expression and with the little assistance that can be given to them and stimulated by the incentive of individual tenure of their lands coupled with personal ownership of the produce they grow, many have shown material progress in the last few years despite local market limitations which greatly hamper land settlement. It may safely be said that such farmers always have abundant and diverse supplies of nutritious food and adequate though not pretentious houses—the main factors in the establishment of a contented peasantry.

This "family production of food to meet family needs is a great safeguard against some of the worst social and economic effects of fluctuations in the income from money crops. There are other reasons too, equally important, why it is most desirable that in every Colonial territory as many people as possible should themselves grow, part at least, of the food stuffs they consume." (1).

These other reasons include the fact that the so-called protective foods are usually more expensive to produce than other important foods so that unless they are home grown they are likely to be neglected; even if they can be purchased they will not be so fresh as the home grown commodities.

Secondly, wage earners in towns frequently find that their wages do not ensure the provision of adequate nutrition for their families. Thus, labourers in Suva tend to depend excessively on tinned salmon, white bread, sugar and tea, which do not provide a balanced diet necessary for continued healthy existence. Similarly, the poorer Indians in the community, especially those living in the towns, suffer from lack of diversity in their food, though not to the same extent as Fijians, who have not yet fully adapted themselves to town living conditions.

Thirdly, compared with the town dweller who depends mainly on wages for his livelihood, the peasant farmer, with his interest in his homestead usually proves the more dependable and loyal citizen, not only because he has the more to lose if he offends local laws or social customs, but also because he usually possesses more moral stability.

Traditionally, the people of this Colony produced all their own foodstuffs and their diet was fairly well balanced by the diversity of the products available to them. This position still holds for those Fijians who live on their own lands and who normally produce enough energy foods in the form of root crops, rice, bananas, etc., and who can, if they so desire, obtain a sufficiency of the protective foods, such as fish, shellfish, pork, ripe fruits, green leaf vegetables, etc.

The general physique of the Fijians living in the country affords ample evidence of a good diet, although insufficient precautions are taken to allow for periods of acute shortage such as occur after a hurricane, or floods, or prolonged ceremonial gatherings, or other adverse factors.

The most outstanding defect in the local native dietary is the absence of milk, milk products and animal fats. Hence mixed farming, which is renumerative is advocated, especially as it involves keeping a material part of a peasant's holding under a soil recuperative cover of perennial grasses or forage crops which tends to restore the physical and biological characteristics of the soil. The grazing of such cover crops and the consequent additions of organic manure to the soil play an important part in the maintenance of adequate quantities of necessary minor elements which in turn affect crop yields and quality.

Indians residing in the country can also provide themselves with an abundant and varied diet if they live on lands secured to them by reasonable terms of tenure though, unfortunately, land tenure is, in many cases, insecure and subject to unreasonably short terms and, under such conditions, it is quite impossible to expect them to develop that degree of permanency in agriculture that is essential to health and contentment.

For wage earners on farms and estates, where suitable land is usually available, every effort should be made to encourage the production by the labourers of a part, at least, of their food requirements including the protective green foods, since it has been found that where this is the practice the labourers are in a far better position to balance their diet and their family budgets than where such necessary food production is not possible—it should even be obligatory on employers to provide such gardens and to require their labour to make full use of them to produce foodcrops in rotation and even to include the keeping of livestock. This provision by estates would tend to stabilise their labour and would obviate the need for the issue of rations, a local custom which renders the labourer neglectful of his sense of his own responsibility and which is a constant source of trouble and expense to estate managers.

In any system of balanced agriculture, the beneficial effects of the family production of food on general nutrition cannot be too highly stressed, and, hence, such production merits every possible encouragement.

Similarly, the production of a surplus of nutritive foods over and above the needs of the family for local sale plays an important part in any balanced peasant agriculture because such surplus provides a supply of good food to those who have no facilities for growing their own requirements and also provides the farmer with cash to purchase his few essential needs which cannot be home grown

In this connexion it should be noted that this Colony is very poorly served in the matter of local market facilities except for the Fijian Market at Nausori which has a monthly turnover of £600 to £700 and is performing a very necessary function at the present time. This matter of markets directly affects the nutrition problem, especially in the towns and hence the importance of reasonably good local marketing conditions is stressed. The difficulty of securing moderately cheap supplies of fresh fruit, vegetables and fish in townships and even country settlements is within the experience of most residents, and high prices with periodic shortages and gluts are as often due to inefficient marketing as to the vagaries of the weather. The establishment of market facilities in producing centres, linked up with town markets, would be a great incentive to producers as well as a boon to consumers, and would result in improved nutrition amongst town wage earners. It should also not be forgotten that the development of export industries is greatly facilitated by the existence of a regular local demand for the product in question.

In regard to the importance of local food production, the Secretary of State for the Colonies said in 1939 that " The labouring population of the Colonies has not given enough time to the growing of food for consumption in the home market . . . . . that is not a sound policy . . . . . one of the things which we have to do in various Colonies is to make the people somewhat less dependent on the returns from export crops. We should encourage them to grow more of their own foodstuffs and to produce more nourishing varieties of local foodstuffs for their own consumption so that they can have fresh vegetables, fresh meat, fresh milk and fresh fruit." In other words, it is necessary to encourage mixed farming extensively so

that fresh protective foods may always be readily available to farmers for their own family use and for sale for local consumption with consequent benefit to the general standard of nutrition.

As any assistance to agriculture tends to promote improved nutrition, the development of industries subsidiary to farming is highly desirable. In this connexion attention is directed to the many products which are now imported but which could be provided by local industry with advantage to the local circulation of more cash. Mention might be made of such industries as bacon and ham curing, the manufacture of jams, cheese, leather, matches, coffee, edible oils, canned fruits and vegetables, dried fish, tobacco etc.

Such local industries, provided that they can be established on a sound basis capable of fair competition with the imported commodities, are worthy of some measure of protection and even financial assistance to ensure their establishment on proper lines.

Such industries would materially assist in the provision of increased local markets for locally produced raw materials grown by the farmers and would in consequence encourage production and thus promote nutrition.

Commodities produced for overseas markets naturally also play an important part in a balanced system of agriculture but they concern nutrition only in that the greater the return from exports the greater the power of the producer to purchase the foodstuffs necessary for his welfare and the greater the wealth available for the prosecution of schemes of education and social welfare. Hence, any measure that increases the value of exports by raising quality standards such as inspection and grading of produce, the use of improved seed or breeding stock, better preparation and packing, etc., has a direct bearing on nutrition.

Unfortunately, returns from export crops have always shown violent fluctuations which often adversely affect the producers and, with estates, frequently lead to reductions in labour or labour wages, with a consequent depressing effect on labour spending power which ultimately proves detrimental to the nutrition of wage earners. The peasant farmer, however, can usually grow his own foodstuffs in addition to his export crops and, hence, his standard of diet is unlikely to suffer as severely as in the case of those dependent entirely on wages. In Malayan experience, depressions in the main industries, rubber and tin, made no difference whatever to the diet of the Malay peasant farmer who grew his own staple food, rice, which together with fish, poultry, fruits and native vegetables that are always available to him, rendered his diet independent of violent fluctuations in commodity prices.

The snare of growing export crops lies in the tendency, when prices for such exports are good, for the grower to neglect the production of his own foods, and this neglect may lead in times of prosperity to actual shortages of good food. Thus, in West Aferica, very high prices for cocoa after the last war led to an actual shortage of the primary necessities of life. Similarly, here in Fiji prosperity in the copra industry greatly stimulated the consumption of tinned fish, despite the very abundant and more nutritious fish available in local waters at a trifling cost. Hence, with an agricultural population, the sale of money crops does not always lead to an improvement in nutrition, though it undoubtedly does act beneficially, if the money is wisely spent.

Efforts to educate young Fijians to the need for a balanced agriculture, with its concomitant balanced nutrition, are in progress at agricultural stations under the control of the Department of Agriculture. More than

50 students on such stations are receiving a balanced and varied diet, suitable to energetic field workers, at reasonable cost and limited to commodities which can readily be produced or procured by peasant farmers. (2)

The diet has proved adequate to the needs of the students who improve markedly in physique and appearance after a few months of residence at the stations—in fact, the average increase in weight for students in 1940 was eleven pounds at the main station, where there are 33 students.

It is hoped that students will later, as farmers on their own lands, continue to vary their diet and thus maintain a good general balance in this respect and bring up healthy families.

The nutritive value of dairy produce is of special importance to the small farmer and efforts to provide instruction in the handling and care of dairy cattle are in operation at two agricultural stations where also the students are given a small milk ration with the hope that they will themselves in time desire to keep cattle for dairy purposes, and thus produce milk for their own use as well as for sale to their neighbours. Similarly, students and newly established peasant farmers are being induced to take an active interest in poultry and pig keeping as a further means of providing necessary food products of a varied nature, and already some progress is recorded. Within available limits, good quality live stock is provided for distribution to small farmers at very reasonable costs, by the Department of Agriculture.

Mixed farming is an essential in a balanced agriculture and hence the need for stressing the keeping of animals by small farmers and others.

One of the fundamental principles of a balanced agriculture is the preservation of soil fertility and the conservation of soil against erosion. The soil is the farmers main asset and hence every effort should be directed towards its retention in good productive condition so that fair returns may always be available for the labour spent in tilling it. Conversely, once the productive top soil is lost from the land by erosion or by any other means, the cost of restoring the fertility is very heavy and frequently the process is so prolonged as to be uneconomic.

The Department of Agriculture has established three small demonstration farms where economic methods of soil conservation are being put into practice. These include rotation cropping, cover crops, diversification of crops, composting and the use of animal manure, contour planting, terracing, retention of cover on hill tops, etc. These instruction methods show that even from very small plots a succession of wholesome food crops may be produced continously and with little ultimate effort if correct practice is followed, they also aim at providing occular demonstration, with a view to inducing farmers to improve their own lands and in so doing, practice better balanced systems of agriculture with consequent improvement of nutrition standards. Similarly, attention is directed to schools where good farming practices are being demonstrated gradually in the hope that the school boys will gain lasting impressions which they will put into practice on their own lands.

In addition, several Provincial training farms are devised to instill into the minds of youthful farming students the need for good cultural methods, crop diversification, soil conservation, and the production of a higher proportion of essential food products, in the hope that abundance of food will lead, by variation in the diet, to better standards of nutrition. These farms, if continuity can be assured, should have an increasingly beneficial effect in time.

Closely linked with conservation of soil is the conservation of inland fishing facilities which provide the Fijian with a cheap and readily available food of high nutritive value. Any methods employed to protect stream and river banks assist in the preservation of inland fishing and hence land alienation and farming activities need to be controlled so that available reservoirs of fish, shellfish etc., may not be damaged by carelessness in cultivation or in the unnecessary clearing of existing vegetation from stream banks. This matter is gradually receiving attention as development of the country is proceeding. Also consideration is being given to the possibility of fresh water fish culture in ponds as a source of family food supply and as a cash asset for small farmers. Such work is still purely in its initial stages but has been successful in other tropical countries. (3)

The control of sea fisheries as an inexhaustible supply of valuable and cheap food has lately been brought under legislative control, since many abuses now practised require rectification and the fishing industry in general is in much need of practical encouragement.

Fishing is a traditional industry as well as a remunerative pastime to the natives of the Colony, and its close relationship with agriculture should always be borne in mind, the more especially as fish provide, at little cost to consumers, an immense source of highly nutritive food of the type necessary to balance their normal large consumption of carbohydrates in the form of root crops.

The industry is hampered by lack of organization as regards the catching as well as the marketing of fish and methods of preserving surplus catches are worthy of trial.

Because of its enormous potentialities in the economic supply of nutritive food for the people the encouragement of this industry by every practicable means is highly desirable and worthy of immediate consideration as a natural complement to agricultural development.

Present experience indicates that the development of peasant farming adopted in recent years is the surest way of ultimately achieving a sound and balanced diet for the people at least cost to themselves and to Government. This policy, however, requires very considerable further development, principally in the direction of more diversified cropping and mixed farming. It involves much greater attention to livestock and by-products, greater variety of agricultural produce generally and the provision of greatly improved local marketing facilities, keeping export possibilities always in mind. The first essential aim, however, in peasant farming is the promotion of a better nutrition by the production of an adequate and varied family food supply, such as will assuredly follow any balanced system of agriculture which may be established by the farmers. It has been shown that a balanced system of agriculture and balanced diet are closely associated and hence the pressing need for closer attention to the development of farming by small holders is definitely indicated.

In conclusion, it may be mentioned that the Secretary of State for the Colonies recently made the following comment on the Annual Report of the Department of Agriculture for 1940:—" I am pleased to note that there is a full realization of the necessity for meeting the changed conditions produced by the war, by the concentration more on the improvement of subsistence farming than, as in the past, on the growing of crops for export.

This change in policy is one to which I attach much importance and I am glad to observe that the concurrent need for organizing internal marketing is recognized and is receiving attention."

REFERENCES.

(1) Report of the Committee on Nutrition in the Colonial Empire, 1939. Part I, para. 117.
(2) "Agriculture and Nutrition," *Agricultural Journal*, Fiji. Vol. 12, No. 1, 1941.
(3) "Fresh Water Fish Culture," *Agricultural Journal*, Fiji. Vol. II, No. 1, 1940.

LEATHER.

By

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In October last an address to the Fiji Society of Science and Industry by the writer described an experiment on local leather tanning which is of considerable interest just now as supplies of imported leather are becoming difficult to obtain.

The following are the main points of that address:—

The flaying or skinning of the hide must be done carefully to avoid flaws in the hide and to secure the most economic spread of the hide.

After flaying, the hide should be washed free of offal and spread out hair downwards on a concrete floor. The flesh side should then be dressed with 12 lb of clean salt which must be rubbed well into the skin and left on it. Hides intended for immediate tanning need not be preserved.

Two types of tanning may be utilised, the chrome or mineral tanning and the vegetable tanning. Chrome tanning is quicker than vegetable tanning and is commonly used for small skins. Vegetable tanning is used for sole leather and belting and usually requires three to four months.

Before tanning, it is usual to remove the hair and the epidermis. If the hide has been salted, washing or scouring is needed to remove the salt. The separation of the hair and epidermis is then brought about by liming that is, the soaking of the hide for six to ten days in a saturated lime solution according to the thickness and size of the hide.

The effect of liming is (*a*) to loosen the hair and epidermis (*b*) to swell the corium which results from a division of the coarser fibres into their constituent fibrils and (*c*) to emulsify or saponify the grease normally present in the corium. This effect is due partly to the alkalinity maintained by the excess of lime, partly to its hydrolytic action and partly to bacterial action. Completion of the liming process is judged by trial. When depilation is complete the hair and epidermis come off readily when rubbed by hand or scraped with an instrument.

The skins are next delimed with ammonium salts (the "bate") or by soaking in an acid bath containing acetic or boric acid of 1½ to 2 per cent solution for one day. The skin is then washed in water before transferring to the tanning tank in which 10 lb of chopped bark are added to 15 gallons of water.

The corium has a fibrous structure; untreated it will absorb water as gelatin does. It is in fact from 75 to 85 per cent collogen, on a dry basis and collagen with water forms gelatin. The tanning process renders the corium fibres water resistant within limits. The skin or corium is now ready for the true tanning process.

Many trees or plants yield tannin. Among the more common are oak bark, wattle or mimosa bark and hemlock bark. The tannin yielding plant represented in Fiji is the mangrove. The bark of the "dogo" tree, *Bruguiera gymnorhiza*, varies a good deal in strength but may contain up to 40 per cent of a dark red but fairly soluble catechol tannin. Any leather making industry established in this country must depend on "dogo" bark as the source of tannin.

Pits for tanning should be of concrete or wood lined; no iron being exposed in the pit, since hides in the pit are badly stained by contact with iron.

The first tan liquor in which the skins are suspended should be a nearly "spent" or weak liquor. The skin is kept moving in this by a mechanical rocker for two days to ensure an even commencement of the tanning process. After two days the skins are moved to a second pit containing somewhat stronger liquor where the rocking is by hand and less frequent. The skins are then moved to a third pit containing a still stronger tannin solution. Up to this stage the skins should be suspended in liquor.

For even penetration of the tan a gradual increase in strength of each liquor is required, since diffusion of the tannin will only take place from a region of higher concentration to a lower. These conditions are usually attained by working the liquors "down the yard," i.e. the pit from which a parcel of hides has just been removed to go into the next stronger one of the series, becomes the one below, and its place is taken by the one above it; thus the goods move in one direction and the liquors in the opposite. This system is advantageous in that the astringent tannins have already been removed by the "goods" leaving only the milder tannins which are more suited to green hides. The time required for the passage of the skins through the "suspenders" is about ten days.

The stronger tanning liquors are applied to the skins by laying the skins in a pit with finely chopped bark laid on top of each. When all the skins are in, liquor is run in to fill the pit. The pelts remain in such liquors for periods of two, three or four months with several repackings. Tannin is absorbed and adds to the weight of the leather.

On removal from these pits the leather is washed and the wrinkles smoothed out by rolling.

Next the leather is "stuffed" with oil or grease either by hand or machinery. Sole leather receives only two per cent of grease; leather belting eight to ten per cent and harness leather twenty to twenty-five per cent.

The fatty material used to stuff hides usually consists of a mixture of tallow and shark oil or neatsfoot oil.

There are several hand tools and machines used to facilitate the making of leather. The rough article can, however, be made without tools. Among the hand tools used are: dehairing knife, fleshing knife, pit hook, shaving knife, moon knife, rounding knife and arm board, whilst among the machines may be mentioned those for scouring, rolling, splitting and stuffiing.

Tanned hides may be split on the flat to make two or more layers of leather, each the same area as the original piece of leather. This is a common practice and is done by means of the band-knife splitting machine.

Leather may also receive certain finishing treatment such as dyeing, polishing or to produce velour, or glace.

As tanning proceeds the strength of the tanning liquid is increased to a maximum of 30 lb of bark to 15 gallons of water. After tanning, the hide

is well washed and dressed and rubbed with a fatty mixture of tallow 2 lb, coconut oil 1 gallon and beeswax ½ lb, which are heated together and then allowed to cool.

The average number of hides exported annually over the past four years was approximately 5,000 with an average valuation of £3,600 per annum. The annual value of imported leather is not less than £3,500 so that it would seem that the foundation of a leather industry is indicated, especially owing to the present difficulty of securing supplies from overseas.

AGRICULTURAL NOTES.

1. PADI VARIETIES, SUVA AREA.

The Quarterly Report of the Agricultural Officer Headquarters (Mr. D. A. Donald) gives an account of a survey of 1940–41 rice plantings by Indians in the Suva area, i.e. the area bounded by the Tamavua, Waimanu and Rewa rivers. The survey showed a total of 527 farmers planting nearly 1,000 acres, including 73 tenants with 117 acres on the newly-opened rice settlement scheme at Toga, between the King's Road and the Rewa River. The distribution of varieties is shown below, and indicates the great popularity of China Patna:—

China Patna	77 % of total acreage.
Serea	11 % ,,
Patarka	3 % ,,
Lal Patna	3 % ,,
Motka	3 % ,,
New Guinea	1 % ,,
Ramacajara, Basmattia, Sonacalif, Karia	1 % ,,

—C.H.

2. PRODUCE SALES, SIGATOKA.

Mr. H. R. Surridge, Agricultural Officer, reports that during the first half of 1941 the Sigatoka office of the Department of Agriculture disposed of considerable quantities of produce on behalf of Fijian farmers who had received Departmental advances for the purchase of stock and implements and who repaid their advances by commission on sales. These included 763 bags of maize, 3 bags of padi, 33 bags of potatoes and 17 bags of peanuts of a total value of £321. During the same period fresh produce to the value of £227 was disposed of to the military on behalf of farmers of all races. Produce sold directly to merchants by Fijians, Indians and Chinese farmers at the weekly riverside market included 1,360 bags of maize, 297 bags of padi and 164 bags of peanuts during the six months. —C.H.

3. COPRA GRADING, 3RD QUARTER, 1941.

The following table compiled from the records of the copra graders at Suva and Levuka shows the quantities of copra according to grades during the period July to September; "Plantation" grade requires 60 marks or over by the Copra Grading Chart. It should be noted that these figures do not show total deliveries at each port but only copra presented for grading.

Place.	Month.	Total No. of sacks presented for grading.	No. of Sacks.		Percentage.	
			Plantation.	F.M.S.	Plantation.	F.M.S.
Suva	July	4,733	3,133	1,600	66	34
	August ..	6,084	1,679	4,405	27	73
	September ..	9,379	2,869	6,510	31	69
Levuka	July	5,000	1,975	3,025	39	61
	August ..	2,755	590	2,165	21	79
	September ..	3,581	1,165	2,416	32	68
Total for 3 months	.....	31,532	11,411	20,121	36	64

For comparison with the above the following table shows how the same copra would have been graded according to the Copra Grading Ordinance, which provides for three grades, had this Ordinance been in force: The same grading chart is used:—Grade 1 = 70 marks and over; Grade 2 = 50–70 marks; Grade 3 = less than 50 marks.

Place.	Month.	No. of Sacks			Percentage.		
		Grade 1	Grade 2	Grade 3	Grade 1	Grade 2	Grade 3
Suva	July ..	200	3,819	714	4	81	15
	August .	28	4,703	1,353	.	82	18
	Sept. ..	721	5,548	3,110	8	59	33
Levuka	July ..	143	3,836	1,021	3	77	20
	August ...	20	1,510	1,225	1	55	44
	Sept. ..	194	2,134	1,253	5	60	35
	...	1,306	21,550	8,676	4	68	28

—C.H.

4. PLANT AND SEED INTRODUCTIONS, 1939–40.

Planting material of possible economic interest is introduced to the Colony from time to time. The following is a brief record of some of those introduced by the Department of Agriculture during 1939 and 1940.

Malayan fruits.—Seed of durian (*Durio zibethinus*), champedak (*Artocarpus polyphema*), chiku or sapodilla plum (*Achras sapota*), rambutan (*Nephelium lappaceum*), pulassan (*N. chryseum*), langsat and duku (*Lansium domesticum*) was received from Malaya. Of these, durian champedak, chiku, langsat and duku germinated and seedlings have been established at the Nasinu Station and some also at the Government Experiment Station, Sigatoka

Oil Palm (*Elæis guinensis*).—Seed of a thin-shelled type was brought from Nigeria. After 18 months in the ground only 14 seeds germinated; they have been planted at Sigatoka.

Tung Oil (*Aleurites montana*).—Seed was introduced from Nyasaland, Burma and Ceylon. Of the former only 1 seedling was obtained, but the Burma seed gave 75 per cent germination and the Ceylon seed approximately 50 per cent. A block of 1½ acres has been planted up at Sigatoka and also a smaller block at the Central Agricultural Station, Naduruloulou.

Desmanthus virgatus.—This is a fodder and pasture legume that has been favourably reported on from Hawaii, whence seed was obtained. It has made good growth at Sigatoka and in Tailevu and has seeded quite freely. It is now under trial in competition with natural grass and weed growth.

Cowpeas.—Four varieties were obtained from New South Wales and are under trial.

Sorghum.—Six varieties from New South Wales are under trial.

Soya bean.—Twelve varieties obtained variously from Australia, Burma and Thailand are under trial against the original introduction of Malayan No. 4 from Malaya some years ago. The crop should find a place in local peasant farming with possibilities of export to Australia.

Tomato.—A reputedly hardy variety from Mauritius was introduced but failed under local conditions.

Ramie (*Boehmeria nivea*).—Plants have been raised from seed obtained from Australia and the crop is under trial for fibre yield. It is a valuable fibre crop, but growth in both the wet and dry zones has been disappointing.

Cotton.—Upland (short staple) varieties from Queensland have been under trial to compare returns with those from Sea Island (long staple) cotton as grown hitherto in Fiji. Yields of over 1,000 lb of seed cotton per acre were obtained on trial plots; investigations are not yet complete.

Lima beans.—Four varieties were obtained from the United States of America but the plants were destroyed in the February (1941) hurricane.

Giant bamboo.—Seed of this useful plant was received from Ceylon. Only one seedling was obtained; this has been planted at the Nasinu Station.

Flax.—Linseed and flax varieties were introduced from Belfast, Northern Ireland. Growth has been fair, but satisfactory retting has not been achieved under local conditions.

Sunflower.—Sunflower seed was obtained from Australia. The crop grew fairly well, yielding at the rate of 537 lb per acre.

Urochloa panicoides.—This grass from Queensland is under observation at Sigatoka, Nadi, Korovou and Naduruloulou.

In addition to the above the following introductions were made but no germination of seed was obtained:—

Cola nut (*Cola acluminata*) from Trinidad; *Tecomaria capensis*, *Malphigia coccigera*, *Sophora tomentosa*, *Brownea coccinea*, *Baccaurea motleyana*, from the Federated Malaya States.

There are also more recent introductions of which no report can yet be made: Algaroba bean from California; padi, groundnut, maize and sorghum varieties from the Belgian Congo; Cardamons (Malabar and Mysore varieties) from Ceylon; breadnut (*Brosimum alicastrum*) from British Honduras and Jamaica; Madagascar Butter beans from Tanganyika; onions from India and Tanganyika. —C.H.

5. MARKETING NOTES.

Maize has been in very short supply for the past three months and prices advanced sharply to as much as 18s. per bag. Reserve stocks held by the Department were almost completely sold out at the fixed price of 14s. per 2 cwt. sack, a total of 350 cwt. being sold during the period August–October. The new crop is now coming into the market and it is considered that there

will be a considerable surplus during the next three months as the New Zealand Government has notified the Department that Dominion production will be sufficient to meet all requirements next year. Production of maize was encouraged as the New Zealand Marketing Department anticipated that sales would be possible. Production of this crop in New Zealand was stimulated by the offer by that Government of guaranteed prices as follows:—

August 5·9d. per bushel rising by 1d. per bushel per month until in April the price would be 6·5d. per bushel

Exports to New Zealand in the early part of the year amounted to 1,074 cwt.

The potato crop in the Sigatoka valley is above normal and wholesale prices are now as low as £10 per ton delivered Suva. Endeavours are being made to restrict imports on a voluntary basis with a view to absorbing the local crop at a reasonable price.

Groundnuts are in keen demand and prices up to 5d. per lb have been paid to growers for unshelled nuts. The crop is estimated at approximately 700 bags, all of which has been absorbed by the retail trade for confectionary purposes.

The yam crop was disappointedly small, a little over 17 tons, practically all from Kadavu, being disposed of through the Department at up to 15s. per cwt. Small baking yams are much sought after by the Europeans in Suva and it is considered that upwards of 50 tons could have been readily disposed of during the season.

Stick tobacco prepared with the inclusion of molasses appears to appeal more to the tastes of the Gilbertese and Ellice Islanders than that flavoured with liquorice and substantial shipments have been made as shipping has permitted. Sales for export for the ten months of this year amount to 3,289 lb.

There is a serious shortage of fresh fruit, and bananas and papayas have been almost unprocurable for some time. Cultivations are recovering from the effects of the February hurricane but normal production of bananas cannot be expected until early in 1942. Melons are in heavy supply and the pineapple crop, which has commenced to mature, should be normal. Green vegetables are plentiful and overproduction of certain lines such as English cabbages and tomatoes is evident. Large quantities of these two vegetables are arriving from Kadavu and Beqa. On the other hand there is a shortage of one of the most important of the native foods, dalo, and prices have advanced to the maximum fixed by the Competent Authority, viz. 1d. per lb. Kumalas have also been in very short supply, selling at £6. 10s. per ton. —A.B.A.

6. NATIVE CULTIVATION.

On a recent visit to Dawasamu excellent native cultivations were seen. These were the holdings of 17 individual farmers. Extensive and very fertile flats were well ploughed, harrowed and otherwise prepared and rice planting was following crops of peanuts, horse traction being entirely used. These settlers in last season produced over 100 bags of padi and over 200 bags of peanuts in addition to maize, varied and abundant native food crops and several had cows, pigs and poultry in addition. Their houses had all been rebuilt since the hurricane in February and were substantial, comfortable and provided with adequate sanitation. All but two had families and the women and children appeared to be very well fed and healthy. All the farmers had already paid their taxes. The Buli is to be congratulated on his successful practical co-operation with the settlers who are obviously healthy and contented and prosperous. —H.W.J.

ENTOMOLOGICAL NOTES.

1. "OTHREIS"—A FRUIT-PIERCING MOTH.

In the Tailevu district, grapefruits were recently found to have been pierced by *Othreis fullonica* L., a large handsome moth with red hind wings ornamented with black markings. Sodium silicofluoride 1 oz. mixed with 1½ lb of Demerara sugar dissolved in 2 gallons of water was recommended as a spray. The humped caterpillar is even more strikingly coloured than the moth having a pair of blue, black and white eye-spots on the second and third abdominal segments. Two colour varieties were noted, one with a greenish yellow background and the other a velvety dark brown. The food of the caterpillar is the well-known "drala," *Erythrina indica*, and not citrus whose fruit attracts the moth only. This separation of the larval and adult food-plants was not brought out in a previous article(1). Felling of these trees was recommended near citrus orchards.

It is of interest to note that in a recent book on citrus pests(2), this moth, spelt "*Orthreis*" is recorded from the East Indies and Philippines but not from Fiji, while a more detailed paper(3) records it on *E. indica* only from Fiji and Samoa with the interesting observation that in Sierra Leone its main predators are bats. Attempts to obtain piercing of ripe citrus fruits in cages at night were unsuccessfully made during September in Suva. Guavas, mangoes and bananas are also recorded in Fiji as being attacked when ripe and the scarcer moth *O. materna* L. also attacks mango fruits on the northern side of Viti Levu where they bear much better than on the wetter and windier southern portion of the island.

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2. INSECT PESTS IN RELATION TO AIR SERVICES IN PACIFIC ISLANDS.

By the time this article is published Fiji will, at last, be linked up by air with the islands to the north east (Hawaii), the west (New Caledonia) and with New Zealand to the south. It therefore concerns all residents in this Colony that every precaution is exercised in order to reduce to a minimumm the introduction of insect pests by means of aeroplanes which may in this way achieve in a few years more than sailing and steam ships did in a century. The classical instance of such as unwanted introduction is the transport in 1930 from West Africa of the malarial mosquito *Anopheles gambiæ* to eastern Brazil, a distance of 3,000 miles (j). Although great advances in aerial quarantine have happened in the succeeding eleven years, yet the danger of such pests as thrips, mealy bugs, green flies and scale insects being introduced in passengers' bunches of flowers and cuttings is a very real one if stringent measures are not taken to check them.

That this problem is realised by Pan-American Airways which is starting a service from California via Hawaii, Canton Island, Fiji, New Caledonia and New Zealand—is shown by their circular dealing with animal and plant quarantine, in which it is laid down that fruit and vegetables cannot be taken into the United States of America or Guam, while any material being returned to San Francisco or Honolulu must be thoroughly sprayed with

an insecticide if there is the slightest possibility of insects being carried. Before ever this southern Pacific service was started an entomologist was sent to New Caledonia to study the insect population of that island so as to know what injurious pests might be accidentally introduced into Honolulu. Further, as mentioned in this *Journal* last year (2), a quarantine station was established on Canton Island 1,500 miles to the north-east of Fiji. This was only following the course which had previously been adopted by Pan-American Airways at Wake and Midway Islands, between Guam and Hawaii, when the northern Pacific service was inaugurated.

It now remains to record the chief harmful insects not occurring in Fiji but which are present in the various countries surrounding this Colony. These potential pests are as follows:—

1. HAWAII.

Ceratitis capitata Wied. Mediterranean fruit-fly.
Lyperosia irritans L. Buffalo or horn-fly.
Chilo simplex Btlr. Rice stem-borer.
Cryptorhynchus mangiferæ F. Mango weevil.
Pieris rapæ L. Cabbage white butterfly.
Adoretus sinicus Burm. Chinese rose beetle.

2. NEW CALEDONIA.

Ueana lifuana Montr. Coffee cicada.
Dacus psidii Frogg. Guava fruit-fly.
Plesispa cocotis Mlk. Coconut leaf-beetle.
Brontispa *longissima* Sharp. Coconut leaf-beetle.
Rhynchophorus ferrugineus F. Large coconut weevil.
Coffearhynchus neocaledonicus. Coffee weevil borer.
Batatarhynchus destructor Hust. Sweet potato weevil.
Papilio cornetti. Citrus swallow-tail butterfly.
Tetranychus neocaledonicus. André Cotton mite.

3. NEW ZEALAND.

Pieris rapæ L. Cabbage white butterfly.
Calandra granaria L. Grain weevil.

4. AUSTRALIA (NEW SOUTH WALES).

Ceratitis capitata Wied. Mediterranean fruit-fly.
Chætodacus tryoni Frogg. Queensland fruit-fly.
Listroderes costirostris. Brown vegetable weevil.
Pieris rapæ L. Cabbage white butterfly.
Monolepta australis Jac. Leaf beetle of citrus or maize.

It will perhaps seem to some readers that mention of specific pests which have yet to arrive is tantamount to crossing one's bridges before they are reached but this is really not so as reasonable anticipation of what insects are quite likely to reach here is valuable knowledge should the occasion ever arise. As proof of the need for the quarantine maintained by the Produce Division is the record of live mango weevils which were intercepted at Suva Wharf in July, 1940(3), this being an insect already present in Hawaii (see above).

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3. THE SMALL COCONUT WEEVIL "DIOCALANDRA" IN OCEANIA.

Many records throughout the South Sea Islands of damage to various parts of the coconut palm are attributed to a small weevil, *Diocalandra taitensis* Guer. The chief interest of such records when closely examined is the great disparity in the accounts of the damage, some writers claiming that this insect is a primary pest and others in the same region, that it is purely secondary, i.e. following after some previous injury has been sustained by the palm.

The following review of the position is confined to Oceania although this genus of weevil ranges through the Philippines and East Indies into the Seychelles and Zanzibar to East Africa. Working from the eastern Islands —the beetle was first described from Tahiti in 1844—it is stated(1) that in the Society Islands the grubs may destroy the leaflets and kill the spikes.

In Samoa it is said to be not significantly injurious to the palm trees(2) and this region is the most easterly extension of the allied *D. ffumenti* F. which though also known in Oceania from as far west as Papua(3) has yet to be recorded from Fiji, intermediate in position. During two years in Samoa, Hopkins(4) did not find it a pest but merely quoted Swezey(2) that it did considerable damage there.

One must also include here Dr. Zacher's account(5) as although the area is merely given as the South Sea Islands it presumably is confined to ex-German Samoa. He states that so long as the damage by the larva to the leaf-stalk (Blattstiel) is restricted the attack is not serious but extensive feeding causes the leaflets (Blattfiedern) to be undernourished and the palm suffers.

In Fiji the position is even more perplexing as the first records(6) were that "damage is very small indeed and practically negligible" and later it was said "not to affect the bearing of the trees and so not at present to be worthy of serious consideration"(7). Simmonds' first reference(8) in 1921 was that this weevil was not then a very serious danger but three years later(9) he said it attacks the trunk, bases of leaves and young nuts and(10) that it causes a certain amount of immature nuts to fall. Still later, however, when this beetle was thoroughly studied by Taylor(11), he stated that it attacked only diseased or injured tissue and was therefore secondary and this was found to hold good in the Solomon Islands for the closely related *D. frumenti*(12). This agrees with Simmonds' previous findings(13) that in the area between New Guinea and the New Hebrides the weevil did little damage, but disagrees with Risbec(13A) who records it as causing serious damage in the New Hebrides and New Caledonia.

The most westerly area to be discussed in this article is the extensive New Guinea region and in the Mandated Territory it is recorded(14) that *Diocalandra frumenti* will lay eggs in cut ends of fronds or where an opening has been made in the midrib which may result in increased damage but that the weevil is only a pest of secondary importance. This holds good in adjacent Papua where an early writer(18) mentioned that though the bases of the fronds or flower-spikes are affected, the attack occurs most commonly where the palm is old, is growing under imperfect soil conditions or has been weakened by attacks of other pests.

Leaving the Western Pacific Islands proper, it is of interest to note that in 1924(16) severe damage was done by *Diocalandra* by borings in fronds, spikes, spikelets and young fruits on Fanning Island, some 4° north of the equator and midway between the Hawaiian and the Society groups. The damage was easy to assess in this isolated atoll and Professor Herms' account leaves no doubt of the damage caused by the grubs resulting in a marked reduction of nut production.

This weevil reached Hawaii Island in 1921 and by the next year was reported on Ohau and Maui but despite this interinsular spread it does not appear to have become a pest: it usually prefers the spathes and leaf bases to the nuts(17).

The foregoing review of the status of *Diocalandra* in the Pacific has been undertaken in order to show the nature of the damage reported from the different islands and also in view of the recent report from Malaita, British Solomon Islands, that an apparently undescribed species of *Diocalandra* is damaging both flowers and young nuts of the coconut palm.

In order to check the present status of this insect in Fiji the writer made some observations on palms on Viti Levu and Rabe finding that the weevils were, in August and October respectively, somewhat scarce and causing next to no primary injury.

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EXTRACTS.

1. DIET AND HEALTH.

A STUDY of the races of India and of their diet, coupled with the experimental work on rats carried out by McCarrison, leaves no doubt that the greatest single factor in the production of good health is the right kind of food and the greatest single factor in the production of bad health is the wrong kind of food. Further, the very remarkable health and physique enjoyed by the Hunza hillmen appears to be due to the efficiency of their ancient system of farming.

Generally speaking the people of northern India, which include some of the finest races of mankind, are wheat eaters, the wheat being consumed in the form of thin, flat cakes made from flour, coarse but fresh-ground in a quern. All the proteins, vitamins, and mineral salts in the grain are consumed. The second most important article of diet is fresh milk and milk products—clarified butter, curds, and buttermilk; the third item is the seed of pulse crops; the fourth vegetables and fruit. Meat, as a rule, is very sparingly eaten except by the Pathans.

When the health and physique of the various northern Indian races were studied in detail the best were those of the Hunzas, a hardy, agile, and vigorous people, living in one of the high mountain valleys of the Gilgit

Agency, where an ancient system of irrigated terraces has been maintained for thousands of years in a high state of fertility. There is little or no difference between the kinds of food eaten by these hillmen and by the rest of northern India. There is, however, a great difference in the way these foods are grown. The total area of the irrigated terraces of the Hunzas is small; ample soil aeration results from their construction; the irrigation water brings annual additions of fine silt produced by the neighbouring glacier; the very greatest care is taken to return to the soil all human, animal, and vegetable wastes after being first composed together. Land is limited: upon the way it is looked after life depends. A perfect agriculture, in which all the factors that combine to produce high quality in food, naturally results.

These men think nothing of covering the 60 miles to Gilgit on foot in one stretch, doing their business and then returning.

—From the *Agricultural Testament*, by Sir Albert Howard, 1940

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2. BEES, STINGS AND HONEY.

" Honey commences its career as an infinitestimal drop of sucrose (cane sugar) and water in the flower, called nectar. By intricate processes, part occurring inside the body of the bee, this is converted into dextrose, (grape sugar) and levulose (fruit sugar), which constitute roughly 70 per cent of honey. There are other constituents: the essences of the flower, the scented oils and gums which give honey its flavour and bouquet. Less obvious, but greater in bulk and much more important, are a variety of salts and minerals, iron, phosphorus, manganese, lime, and sulphur, valuable because they are assimilable. The iron in numerous tonics, for instance, probably never gets into the human system at all, the iron in honey does. Then there are albumen, fats, waxes, formic and mallic acids, nitrogenous pollen and last, but not least, some very complex digestive enzymes capable of such useful feats as converting starch into malt.

" Chiefly honey is a food; the only food that requires no digestion and passes directly into the bloodstream. It is a stimulant and a tonic. It has a strengthening effect on the heart and is a medicine for the liver. Its acids and salts make it a gentle laxative. It is a skin and hair food. It is a powerful antiseptic also; when next you cut your finger try applying honey and a bandage. The speed with which the wound deals will surprise you. If honey were nasty I believe more people would take it for its medicinal value. As it is, honey is bought almost solely as a sweet."

—John Crompton in *Readers' Digest*, April, 1941.

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3. WHO SHALL INHERIT THE EARTH—MAN OR BUG?

Insect pests are the producers' worst enemies—ask any sheep man what he thinks about blowflies, for instance—and that is why we have to be keenly alert in war time, and especially so when we remember that with modern speed in transport, particularly air transport, much of our immunity

from insect invasion has gone. When long voyages were the rule, the very length of a voyage constituted an effective period of quarantine so far as we in Australia were concerned. In the United States there is a real fear that this war may increase the worry of those concerned with insect pest control. In a publication received in the American mail recently, the United States Bureau of Entomology and Plant Quarantine had this to say:—

> "If history is allowed to repeat, the war may add to the insect pests that have invaded new territory because of armed conflict among men. The Hessian fly (there is a familiar ring about that—the Hess-ian fly !) which each year destroys wheat with an estimated value of many millions, came with the German troops in the days of the War of Independence.
>
> "Then the bedbug, cockroach, and housefly found the trip to North America easy and the new world congenial, with the codling moth, the Japanese beetle, and the pink bollworm confirming this subsequently."

Evidently those pests did not trouble much about the Monroe Doctrine !

On the other hand, the dreaded Colorado beetle, which does so much damage to potato crops, crossed the Atlantic to Europe in 1917 with the American army and settled in France, and afterwards spread to Germany, where it is now one of the worst farm pests. That suggests that the Germans will receive something even more deadly and disturbing from America this time.

It is estimated that there are over 400 million kinds of insects in the world, and all of them are of significance to the human race. All are our competitors for the world's food supply. Who shall inherit the earth—man or bug—will depend in the final analysis on which creature is most efficient in fighting for his daily ration.

—*Queensland Agricultural Journal*, Vol. 55, Part 6, June, 1941.

4. BACK TO THE LAND.

The Secretary of State for the Colonies has recently stated that "our aim should be to make the Colonies self supporting as far as possible and to train the native to get the best living he can on his own holding" and further that the economic problems should be "approached from the view point of making the native cultivator live on his own holding rather than off his holding."

—*The Crown Colonist*, September, 1941.

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—R.J.A.W.L.

ERRATA.

Vol. 12, No. 4, December, 1941.

Page 95, fifth line from end. For " styes " read sties.
Page 96, fourth paragraph, fourth line. For " Manilla " read Manila.
Page 99, last line but one. For " focused " read focussed.
Page 99, last line. Insert comma between "*viridula*) " and " the."
Page 100, line 6. For " Raratonga " read Rarotonga.
Page 100, paragraph No. 33. For " eodema " read œdema. For " aggulination " read agglutination.
Page 108, sixth paragraph. For "Aferica " read Africa.
Page 111, Reference (3). For " Vol. II " read Vol. 11.
Page 114, last paragraph but one. For "*guinensis*" read *guineensis.*
Page 115, last paragraph but two. For "*acluminata*" read *acuminata.*
Page 115, last paragraph but two. For "*Malphigia*" read *Malpighia.*
Page 117, last paragraph but one. For " (*j*) " read (*i*).
Page 118, under New Caledonia. Insert full stop between "André " and " Cotton mite."
Page 118, under New Zealand. For "*granavia*" read *granaria.*
Page 119, second paragraph. For "*foumenti*" read *frumenti.*
Page 120, line 2. For " Ohau " read Oahu.
Page 120, Reference (8). For " Simmons " read Simmonds.
Page 120, Reference (13A). For " eolon " read Colon.

ADDENDUM.

Page 104. The authors of " Vegetable Gardening in Malaya " are J. N. Milsum and D. H. Grist. The book is published at 2 Malaya dollars (5 shillings) nett by the Department of Agriculture, Federated Malay States.

Editorial note.—The above lengthy list of errata is regretted but was occasioned by the Editor's absence in camp when no proof reading could be carried out.